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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,362	02/07/2002	Kuan-Yu Fu	CPH35726-D1	2716

7590

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EXAMINER

HU, SHOUXIANG

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 07/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/072,362

Applicant(s)

FU, KUAN-YU

Examiner

Shouxiang Hu

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 February 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 10-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☒ Certified copies of the priority documents have been received in Application No. 09/059,548.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because Fig 2C contains informal handwritings. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

2. Claims 10-12 are objected to because of the following informalities and/or defects:

In claim 10, the terms of "first deep source/drain junction region" and "second source/drain junction region" should read respectively as: --deep source region-- and --deep drain region--, to better reflect the subject matters of the instant invention that the real effective source or drain junction (formed with the channel region) is located beneath the trench, as shown in Fig. 4D of the instant disclosure.

In addition, the term of "trench disposed in the channel region" recited in claim 10 should read as: --trench disposed near the channel region--, since the real channel region is located outside the trench, as shown in Fig. 4D of the instant invention. And, the term of "disposed over the said" recited in claim 10 should read as: --disposed over said--.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 10 and 12, as being best understood in view of the claim objections set forth above, are rejected under 35 U.S.C. 102(b) as being anticipated by Lancaster (US 4,835,584).

Lancaster discloses a semiconductor structure (Figs. 1-5L), comprising a substrate having an active region including a channel region (under each bottom of the gate oxide layer 57) and a non-channel region surrounding the channel region; a first trench and a second trench disposed near the channel region, a thick insulating layer (57; a silicon oxide gate insulating layer, about 0.1  $\mu\text{m}$ , see col. 3, line 61) over the first and second trenches and conformal to the profile of the first and second trenches; a gate electrode (58) disposed over the two trenches and comprising a first vertical portion, a second vertical portion and a horizontal portion, with the first vertical portion being embedded inside the first trench, the second vertical portion being embedded inside the second trench, and the horizontal portion being disposed over the substrate and connecting the first and second vertical portions together; a first shallow doped region (the top horizontal portion of region 73) within the substrate at an upper corner adjacent to the first vertical portion of the gate electrode and a second shallow doped region (the upper horizontal portion of region 74) at an upper corner adjacent to the

second vertical portion of the gate electrode; a deep source region (the lower portion of region 73) and a deep drain region (the lower portion of region 74) disposed in a region in the substrate at a depth deeper than the first and second trenches, wherein the active region has a first conductivity type, as the substrate it self has first-type impurities therein (see col. 7, lines 42-43); and source/drain junction naturally exists between the source/drain and the channel region.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lancaster (US 4,835,584) in view of Kimura (US 5029,321).

The disclosure of Lancaster is discussed as applied to claims 10 and 12.

Although Lancaster does not expressly disclose that the thick insulating layer is formed through thermal oxidation, one of ordinary skill in the art would readily recognize that such thick insulating layer used as a gate oxide layer can be readily formed through thermal oxidation for achieving high quality in the gate insulating layer, as evidenced in Kimura (see the thermal oxide layer 3 in Fig. 7E).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the semiconductor structure of Lancaster with the

thick insulating layer (the gate oxide layer) being formed through thermal oxidation, as taught in Kimura, so that a semiconductor device with a high quality gate insulting layer would be obtained.

### ***Conclusion***

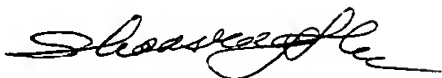
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References C and D are cited as being related to a semiconductor device having a trenched gate structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703) 306-5729. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH  
June 27, 2003

  
Shouxiang Hu  
Patent Examiner